WHAT IS CLAIMED IS:

Sub Q. 1.   An image pickup method of synthesizing a plurality of images acquired by sensing an object under different exposure conditions to produce a single image excellent in gradation reproducibility, the method comprising the steps of:

sensing an object under different exposure conditions to acquire a plurality of images;

compensating the levels of the plurality of images on the basis of the exposure conditions under which they have been sensed respectively, to provide a plurality of compensated images;

synthesizing the plurality of compensated images to produce a single synthetic image having a wide dynamic range; and

compressing the synthetic image to an extent depending upon the performance of its output destination to produce a compressed image.

2.   The method as set forth in Claim 1, further comprising the step of subtracting from the pixel level of each of the plurality of images a positive value given based on the exposure condition under which each of the images has been sensed to produce the compensated image.

3.   The method as set forth in Claim 2, further comprising the steps of:

calculating a mean pixel value of each of the plurality of images; and

multiplying the mean pixel value obtained at the mean calculating step by a factor set based on the exposure condition to calculate a positive value.

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4.   The method as set forth in Claim 3, further comprising the steps of:

time-smoothing the positive value obtained at the multiplying step; and

subtracting the time-smoothed positive value from the pixel level of each of

the plurality of images.

5.   The method as set forth in Claim 3, wherein the factor is set larger for the

image having been sensed with a larger exposure at the image sensing step.

6.   The method as set forth in Claim 2, further comprising the steps of:

filtering the signal of each of the plurality of images by a predetermined low-

pass filter; and

multiplying an output obtained at the filtering step by a factor set based on

the exposure condition under which the image has been sensed to calculate a

positive value.

7.   The method as set forth in Claim 6, further comprising the steps of:

time-smoothing the positive value obtained at the multiplying step; and

subtracting, at the subtracting step, the positive value obtained at the time-

smoothing step from the pixel level of each of the plurality of images.

8.   The method as set forth in Claim 6, wherein the factor is set larger for the

image having been sensed with a larger exposure at the image sensing step.

9.   The method as set forth in Claim 1, wherein each of the plurality of images

acquired at the image sensing step is an image signal in which a frequency-

modulated color signal is superposed on a brightness signal, the method further

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comprising the step of separating the image signal into the brightness and color signals; and

the brightness signal and color signal separated at the signal separating step being compensated at the level compensating step to produce a compensated brightness signal and a compensated color signal, respectively;

the compensated brightness and color signals being synthesized at the image synthesizing step to produce a synthetic brightness signal and a synthetic color signal, respectively; and

the synthetic brightness and color signals being compressed at the image compressing step to produce a compressed brightness signal and a compressed color signal, respectively.

10.   The method as set forth in Claim 9, wherein at the level compensating step:

a compensation amount is calculated based on the brightness signal separated at the signal separating step;

the level of the brightness signal is compensated with the compensation amount to produce a compensated brightness signal; and

the compensated color signal is produced based on the compensated brightness signal.

11.   The method as set forth in Claim 9, further comprising the step of mixing the compressed brightness and color signals.

12.   An image pickup method of synthesizing a plurality of images acquired by

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sensing an object under different exposure conditions to produce a single image

excellent in gradation reproducibility, the method comprising the steps of:

sensing an object under different exposure conditions to acquire a plurality

of images;

synthesizing the plurality of compensated images to produce a single

synthetic image having a wide dynamic range;

compressing the dynamic range of the synthetic image to an extent

depending upon the performance of its output destination to produce a compressed

image; and

compensating the level of the compressed image to provide a compensated

compressed image.

13.   The method as set forth in Claim 12, further comprising the step of

subtracting a predetermined positive value from each pixel level of the

compressed image to produce the compensated compressed image.

14.   The method as set forth in Claim 13, further comprising the steps of:

filtering the signal of the compressed image by a predetermined low-pass

filter;

normalizing an output value obtained at the signal filtering step; and

multiplying the output obtained at the normalizing step by a predetermined

factor to calculate a positive value.

15.   The method as set forth in Claim 14, further comprising the steps of:

time-smoothing the positive value obtained at the multiplying step; and

subtracting, at the subtracting step, the time-smoothed positive value from each pixel level of the compressed image.

16. The method as set forth in Claim 12, wherein each of the plurality of images acquired at the image sensing step is an image signal in which a frequency-modulated color signal is superposed on a brightness signal, the method further comprising the step of separating the image signal into the brightness and color signals; and

the brightness signal and color signal separated at the signal separating step being synthesized respectively at the image synthesizing step to produce a synthetic brightness signal and a synthetic color signal, respectively;

the synthetic brightness and color signals being compressed respectively at the image compressing step to produce a compressed brightness signal and a compressed color signal, respectively; and

the compressed brightness and color signals being compensated at the level compensating step to produce a compensated compressed brightness signal and a compensated compressed color signal, respectively.

17. The method as set forth in Claim 16, wherein at the level compensating step:

a compensation amount is calculated based on the compressed brightness signal separated at the signal separating step;

the level of the compressed brightness signal is compensated with the

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compensation amount to produce a compensated compressed brightness signal; and

the compensated compressed color signal is produced based on the compensated compensated brightness signal.

18. The method as set forth in Claim 16, further comprising the step of mixing the compensated compressed brightness and color signals.

19. An image pickup apparatus adapted to produce a single image excellent in gradation reproducibility from a plurality of images acquired by sensing an object under different exposure conditions, the apparatus comprising:

means for sensing an object under different exposure conditions to acquire a plurality of images;

means for compensating the levels of the plurality of images on the basis of the exposure conditions under which they have been sensed respectively, to provide a plurality of compensated images;

means for synthesizing the plurality of compensated images to produce a single synthetic image having a wide dynamic range; and

means for compressing the synthetic image to an extent depending upon the performance of its output destination to produce a compressed image.

20. The apparatus as set forth in Claim 19, wherein the level compensating means comprises means for subtracting from the pixel level of each of the plurality of images a positive value given based on the exposure condition under which each of the images has been sensed to produce the compensated image.

21. The apparatus as set forth in Claim 20, wherein the level compensating means comprises:

means for calculating a mean pixel value of each of the plurality of images; and

means for multiplying the mean pixel value provided by the mean calculating means by a factor set based on the exposure condition to calculate a positive value.

22. The apparatus as set forth in Claim 21, wherein the level compensating means comprises:

means for time-smoothing the positive value provided by multiplying means; and

means for subtracting the time-smoothed positive value from the pixel level of each of the plurality of images.

23. The method as set forth in Claim 21, wherein the factor is set larger for the image having been sensed with a larger exposure by the image sensing means.

24. The apparatus as set forth in Claim 20, wherein the level compensating means comprises:

means for allowing to pass the signal of each of the plurality of images through a predetermined low-pass filter; and

means for multiplying an output of the signal filtering means by a factor set based on the exposure condition under which the image has been sensed to calculate a positive value.

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25.   The apparatus as set forth in Claim 24, wherein the level compensating means comprises means for time-smoothing the positive value provided by the multiplying means;

the subtracting means subtracting the time-smoothed positive value from the pixel level of each of the plurality of images.

26.   The apparatus as set forth in Claim 24, wherein the factor is set larger for the image having been sensed with a larger exposure by the image sensing means.

27.   The apparatus as set forth in Claim 19, wherein the image sensing means is adapted to output an image signal in which a frequency-modulated color signal is superposed on a brightness signal, the apparatus further comprising means for separating the image signal into the brightness and color signals; and

the level compensating means compensating the brightness signal and color signal separated by the signal separating means to produce a compensated brightness signal and a compensated color signal, respectively;

the signal synthesizing means synthesizing the compensated brightness and color signals to produce a synthetic brightness signal and a synthetic color signal, respectively; and

the image compressing means the synthetic brightness and color signals to produce a compressed brightness signal and a compressed color signal, respectively.

28.   The apparatus as set forth in Claim 27, wherein at the level compensating

means calculates a compensation amount based on the brightness signal separated by the signal separating means, compensates the level of the brightness with the compensation amount to produce a compensated brightness signal, and produces the compensated color signal based on the compensated brightness signal.

29.   The method as set forth in Claim 27, further comprising means for mixing the compressed brightness and color signals.

30.   An image pickup apparatus adapted to synthesize a plurality of images acquired by sensing an object under different exposure conditions to produce a single image excellent in gradation reproducibility, the apparatus comprising:

means for sensing an object under different exposure conditions to acquire a plurality of images;

means for synthesizing the plurality of compensated images to produce a single synthetic image having a wide dynamic range;

means for compressing the dynamic range of the synthetic image to an extent depending upon the performance of its output destination to produce a compressed image; and

means for compensating the level of the compressed image to provide a compensated compressed image.

31.   The apparatus as set forth in Claim 30, wherein the level compensating means comprises means for subtracting a predetermined positive value from each pixel level of the compressed image to produce the compensated compressed

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image.

32. The apparatus as set forth in Claim 31, wherein the level compensating means comprises:

means for filtering the signal of the compressed image;

means for normalizing an output value provided by the signal filtering means; and

mans for multiplying the output provided by the normalizing means by a predetermined factor to calculate a positive value.

33. The apparatus as set forth in Claim 32, wherein the level compensating means comprises:

means for time-smoothing the positive value provided by the multiplying means; and

means for subtracting the time-smoothed positive value from each pixel level of the compressed image.

34. The apparatus as set forth in Claim 30, wherein the image sensing means is adapted to output an image signal in which a frequency-modulated color signal is superposed on a brightness signal, the apparatus further comprising means for separating the image signal into the brightness and color signals;

the signal synthesizing means synthesizing the brightness signal and color signal separated by the signal separating mean to produce a synthetic brightness signal and a synthetic color signal, respectively;

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the image compressing means compressing the synthetic brightness and color signals to produce a compressed brightness signal and a compressed color signal, respectively; and

the level compensating means compensating the compressed brightness and color signals to produce a compensated compressed brightness signal and a compensated compressed color signal, respectively.

35. The apparatus as set forth in Claim 34, wherein the level compensating means calculates a compensation amount based on the compressed brightness signal separated by the signal separating means, compensates the level of the compressed brightness signal with the compensation amount to produce a compensated compressed brightness signal, and produces the compensated compressed color signal based on the compensated compressed brightness signal.

36. The apparatus as set forth in Claim 34, further comprising means for mixing the compensated compressed brightness and color signals.

37. An image processing method of synthesizing a plurality of input images acquired by sensing an object under different exposure conditions to produce a single image excellent in gradation reproducibility, the method comprising the steps of:

receiving a plurality of images acquired by sensing an object under different exposure conditions and compensating the levels of the plurality of input images on the basis of the exposure conditions under which they have been sensed

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respectively, to provide a plurality of compensated images;

synthesizing the plurality of compensated images to produce a single synthetic image having a wide dynamic range; and

compressing the synthetic image to an extent depending upon the performance of its output destination to produce a compressed image.

38. The method as set forth in Claim 37, further comprising the step of subtracting from the pixel level of each of the plurality of input images a positive value given based on the exposure condition under which each of the images has been sensed to produce the compensated image.

39. The method as set forth in Claim 38, further comprising the steps of:

calculating a mean pixel value of each of the plurality of input images; and

multiplying the mean pixel value obtained at the mean calculating step by a factor set based on the exposure condition to calculate a positive value.

40. The method as set forth in Claim 39, further comprising the steps of:

time-smoothing the positive value obtained at the multiplying step; and

subtracting the time-smoothed positive value from the pixel level of each of the plurality of input images.

41. The method as set forth in Claim 39, wherein the factor is set larger for the input image having been sensed with a larger exposure at the image sensing step.

42. The method as set forth in Claim 38, further comprising the steps of:

filtering the signal of each of the plurality of input images by a

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predetermined low-pass filter; and

multiplying an output obtained at the filtering step by a factor set based on the exposure condition under which the image has been sensed to calculate a positive value.

43. The method as set forth in Claim 42, further comprising the steps of:

time-smoothing the positive value obtained at the multiplying step; and

subtracting, at the subtracting step, the positive value obtained at the time-smoothing step from the pixel level of each of the plurality of input images.

44. The method as set forth in Claim 42, wherein the factor is set larger for the input image having been sensed with a larger exposure at the image sensing step.

45. The method as set forth in Claim 37, wherein each of the plurality of input images acquired at the image sensing step is an image signal in which a frequency-modulated color signal is superposed on a brightness signal, the method further comprising the step of separating the image signal into the brightness and color signals; and

the brightness signal and color signal separated at the signal separating step being compensated at the level compensating step to produce a compensated brightness signal and a compensated color signal, respectively;

the compensated brightness and color signals being synthesized at the image synthesizing step to produce a synthetic brightness signal and a synthetic color signal, respectively; and

the synthetic brightness and color signals being compressed at the image

compressing step to produce a compressed brightness signal and a compressed

color signal, respectively.

46.   The method as set forth in Claim 45, wherein at the level compensating step:

a compensation amount is calculated based on the brightness signal

separated at the signal separating step;

the level of the brightness signal is compensated with the compensation

amount to produce a compensated brightness signal; and

the compensated color signal is produced based on the compensated

brightness signal.

47.   The method as set forth in Claim 45, further comprising the step of mixing

the compressed brightness and color signals.

48.   An image processing method of synthesizing a plurality of input images

acquired by sensing an object under different exposure conditions to produce a

single image excellent in gradation reproducibility, the method comprising the steps

of:

receiving a plurality of images acquired by sensing an object under different

exposure conditions and synthesizing the plurality of input images to produce a

single synthetic image having a wide dynamic range;

compressing the dynamic range of the synthetic image to an extent

depending upon the performance of its output destination to produce a compressed

image; and

compensating the level of the compressed image to provide a compensated compressed image.

49.   The method as set forth in Claim 48, further comprising the step of subtracting a predetermined positive value from each pixel level of the compressed image to produce the compensated compressed image.

50.   The method as set forth in Claim 49, further comprising the steps of:

filtering the signal of the compressed image by a predetermined low-pass filter;

normalizing an output value obtained at the signal filtering step; and

multiplying the output obtained at the normalizing step by a predetermined factor to calculate a positive value.

51.   The method as set forth in Claim 50, further comprising the steps of:

time-smoothing the positive value obtained at the multiplying step; and

subtracting, at the subtracting step, the time-smoothed positive value from each pixel level of the compressed image.

52.   The method as set forth in Claim 48, wherein each of the plurality of input images acquired at the image sensing step is an image signal in which a frequency-modulated color signal is superposed on a brightness signal, the method further comprising the step of separating the image signal into the brightness and color signals; and

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the brightness signal and color signal separated at the signal separating step being synthesized respectively at the image synthesizing step to produce a synthetic brightness signal and a synthetic color signal, respectively;

the synthetic brightness and color signals being compressed respectively at the image compressing step to produce a compressed brightness signal and a compressed color signal, respectively; and

the compressed brightness and color signals being compensated at the level compensating step to produce a compensated compressed brightness signal and a compensated compressed color signal, respectively.

53.   The method as set forth in Claim 52, wherein at the level compensating step:

a compensation amount is calculated based on the compressed brightness signal separated at the signal separating step;

the level of the compressed brightness signal is compensated with the compensation amount to produce a compensated compressed brightness signal; and

the compensated compressed color signal is produced based on the compensated compensated brightness signal.

54.   The method as set forth in Claim 52, further comprising the step of mixing the compensated compressed brightness and color signals.

55.   An image processing apparatus adapted to produce a single image excellent in gradation reproducibility from a plurality of input images acquired by sensing an object under different exposure conditions, the apparatus comprising:

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means for receiving a plurality of input images acquired by sensing an object under different exposure conditions and compensating the levels of the plurality of input images on the basis of the exposure conditions under which they have been sensed respectively, to provide a plurality of compensated images;

means for synthesizing the plurality of compensated images to produce a single synthetic image having a wide dynamic range; and

means for compressing the synthetic image to an extent depending upon the performance of its output destination to produce a compressed image.

56. The apparatus as set forth in Claim 55, wherein the level compensating means comprises means for subtracting from the pixel level of each of the plurality of input images a positive value given based on the exposure condition under which each of the input images has been sensed to produce the compensated image.

57. The apparatus as set forth in Claim 56, wherein the level compensating means comprises:

means for calculating a mean pixel value of each of the plurality of input images; and

means for multiplying the mean pixel value provided by the mean calculating means by a factor set based on the exposure condition to calculate a positive value.

58. The apparatus as set forth in Claim 57, wherein the level compensating means comprises:

means for time-smoothing the positive value provided by the multiplying

means; and

means for subtracting the time-smoothed positive value from the pixel level of each of the plurality of input images.

59. The method as set forth in Claim 57, wherein the factor is set larger for the input image having been sensed with a larger exposure by the image sensing means.

60. The apparatus as set forth in Claim 56, wherein the level compensating means comprises:

means for filtering the signal of each of the plurality of input images by a predetermined low-pass filter; and

means for multiplying an output of the signal filtering means by a factor set based on the exposure condition under which the image has been sensed to calculate a positive value.

61. The apparatus as set forth in Claim 60, wherein the level compensating means comprises means for time-smoothing the positive value provided by the multiplying means;

the subtracting means subtracting the time-smoothed positive value from the pixel level of each of the plurality of input images.

62. The apparatus as set forth in Claim 60, wherein the factor is set larger for the input image having been sensed with a larger exposure by the image sensing means.

63. The apparatus as set forth in Claim 55, wherein the image sensing means

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is adapted to output an image signal in which a frequency-modulated color signal is superposed on a brightness signal, the apparatus further comprising means for separating the image signal into the brightness and color signals; and

the level compensating means compensating the brightness signal and color signal separated by the signal separating means to produce a compensated brightness signal and a compensated color signal, respectively;

the signal synthesizing means synthesizing the compensated brightness and color signals to produce a synthetic brightness signal and a synthetic color signal, respectively; and

the image compressing means the synthetic brightness and color signals to produce a compressed brightness signal and a compressed color signal, respectively.

64. The apparatus as set forth in Claim 63, wherein at the level compensating means calculates a compensation amount based on the brightness signal separated by the signal separating means, compensates the level of the brightness with the compensation amount to produce a compensated brightness signal, and produces the compensated color signal based on the compensated brightness signal.

65. The method as set forth in Claim 63, further comprising means for mixing the compressed brightness and color signals.

66. An image processing apparatus adapted to synthesize a plurality of input images acquired by sensing an object under different exposure conditions to

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produce a single image excellent in gradation reproducibility, the apparatus comprising:

means for receiving a plurality of images acquired by sensing an object under different exposure conditions and synthesizing the plurality of input images to produce a single synthetic image having a wide dynamic range;

means for compressing the dynamic range of the synthetic image to an extent depending upon the performance of its output destination to produce a compressed image; and

means for compensating the level of the compressed image to provide a compensated compressed image.

67.   The apparatus as set forth in Claim 66, wherein the level compensating means comprises means for subtracting a predetermined positive value from each pixel level of the compressed image to produce the compensated compressed image.

68.   The apparatus as set forth in Claim 67, wherein the level compensating means comprises:

means for filtering the signal of the compressed image;

means for normalizing an output value provided by the signal filtering means; and

mans for multiplying the normalized output by a predetermined factor to calculate a positive value.

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69.   The apparatus as set forth in Claim 68, wherein the level compensating means comprises:

means for time-smoothing the positive value provided by the multiplying means; and

means for subtracting the time-smoothed positive value from each pixel level of the compressed image.

70.   The apparatus as set forth in Claim 66, further comprising means for separating the image signal into the brightness and color signals;

the signal synthesizing means synthesizing the brightness signal and color signal separated by the signal separating mean to produce a synthetic brightness signal and a synthetic color signal, respectively;

the image compressing means compressing the synthetic brightness and color signals to produce a compressed brightness signal and a compressed color signal, respectively; and

the level compensating means compensating the compressed brightness and color signals to produce a compensated compressed brightness signal and a compensated compressed color signal, respectively.

71.   The apparatus as set forth in Claim 70, wherein the level compensating means calculates a compensation amount based on the compressed brightness signal separated by the signal separating means, compensates the level of the compressed brightness signal with the compensation amount to produce a

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compensated compressed brightness signal, and produces the compensated

compressed color signal based on the compensated compressed brightness signal.

72.   The apparatus as set forth in Claim 70, further comprising means for mixing

the compensated compressed brightness and color signals.